Reduced Gravity Flight Demo of RINGS

Problem Statement

- Formation flight of spacecraft clusters is ultimately life-limited by a finite propellant supply
- Using Electromagnetic Formation Flight (EMFF), relative motion can be controlled without propellant
- Parabolic flights will help to reduce the risk of wasting valuable testing time on-orbit during planned ISS ops
- NASA, DoD, NRO, ESA – Any entity utilizing formation flight for on-orbit assembly or aperture synthesis

Technology Development Team

- PI: Prof. Ray Sedwick, University of Maryland, sedwick@umd.edu
- DARPA, TTO, Dr. David Barnhart, david.barnhart@darpa.mil
- NASA HQ, Mr. Jason Crusan, jason.crusan@nasa.gov
- Mr. John Merk, Aurora Flight Sciences, jmerk@aurora.aero
- Prof. David Miller, MIT, millerd@mit.edu

Proposed Flight Experiment

Experiment Readiness:

- Hardware is complete now and under ground test
- It will be ready for testing by January 2013.

Test Vehicle:

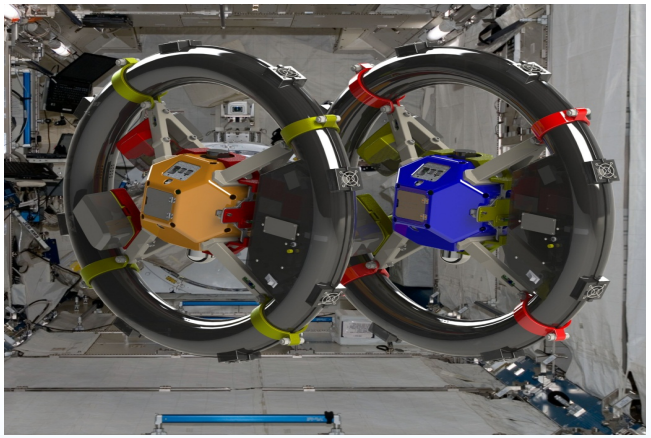
- Parabolic Aircraft

Test Environment:

- The relevant environment is micro-gravity to support the testing and verification of formation control algorithms using EMFF

Test Apparatus Description:

- Below is a rendering of the hardware as it would look mounted to two SPHERES on ISS



Technology Maturation

- Currently TRL4
- TRL5 – Parabolic Flight
  - Early 2013 (desired?)
  - Preliminary dynamics and control law verification
- TRL6 – Operations on ISS (manifested)
  - Launch in December or June
  - Extensive dynamics and control development and test program
- Should reach TRL6 by Fall 2013

Objective of Proposed Experiment

- Objectives:
  - System ID, Force and Torque model verification, Preliminary control law stability verification
- Data:
  - Global and inertial metrology data to compare system response to electromagnetic actuation as compared to models and simulation

TA02 – In-Space Prop. Systems, TA03 – Space Power and Energy Storage, TA04 – Robotics, Tele-robotics& Auto. Systems